

Hydrogen Generation by Borohydrides: Critical Issues for Portable Applications

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Abstract

High volumetric and gravimetric efficiency are key to potential hydrogen energy carriers. Sodium borohydride emerges as such potentiality and a storage capacity well within DOE targets for 2015. Limitations exist due to the fact that hydrolysis is restricted by available water and due to the lack of low cost re-usable catalysts.

An extensive amount of work has been done in our laboratories on Ni and Ru based catalysts, including synthesis and characterization and solutions have been found for durability, stability and reutilization under operating conditions in small volume batch reactors. Results showed that the Langmuir-Hinshelwood model described fairly well the reaction kinetics for all tested temperatures up to 60°C and up to reactant exhaustion.

In this work, issues such as self-hydrolysis, stability of solutions for storage, water management, some aspects of the catalyzed hydrolysis as well as gas conditioning are studied in order to associate a storage solution with sodium borohydride to a low power air breathing cathode PEM fuel cell.

Keywords: hydrogen storage, fuel cells, borohydrides, portable applications